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Commissioner of Patents and Trademarks

Office Action Summary

Application No.
08/880,616

Applicant(s)
Cohen et al.

Examiner
Gary Fourson

Group Art Unit
2755



☒ Responsive to communication(s) filed on Jun 23, 1997

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 1-18 is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-18 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been
☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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DETAILED ACTION

Prior Art Cited

1. Applicant referenced the AIX™ operating system by international Business Machines Corporation. Examiner requests that if applicant is aware of any publications about the AIX™ system and the features cited in the specification (Background of the Invention) from page 2 line 20 to page 3 line 7, copies are requested so that they may be fully considered towards the merits of the instant application.

Drawings

2. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed. A three month requirement exists for filing the formal drawings in the event of an allowance. This three month period includes a resubmission of formal drawings in the event that the first formal drawing submission is objected to by the draftsman.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 15 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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Claim 15 recites the limitation “said remotely located scheduler” in lines 2-3. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. **Claims 1-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cameron et al. (5,325,526) in view of Admitted Prior Art (Applicant’s Specification page 2 line 20 through page 3 line 7).**

With respect to **claim 1**, Cameron et al. teaches computing nodes with a plurality of local processes (processors P1, P2, and P3; column 7 line 36, “... more than one application program may be loaded on a single node.”), scheduler means (scheduler 410, 510, or 612), and dynamically creating a schedule of tasks utilizing priorities (column 14 lines 33-42: interactive scheduling). However, Cameron et al. does not teach a local scheduler comprising means for ascertaining which process(es) are assigned to the tasks nor means for prioritizing the processes.

Applicant has divulged on pages 2-3 that the AIX™ operating system assigns a common priority to the process(es) required for (or correlated to) a task. Having the processes associated with individual tasks assigned priority corresponding to the priorities of the individual tasks would have been a highly desirable feature in the art. Therefore, it would have been obvious to

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one of ordinary skill in the art at the time the invention was made to incorporate the process priority information of IBM into the task scheduling system of Cameron et al., because correlating local processes with the current or next task would have been expected to result in higher cache preloading efficiency.

With respect to **claim 11**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claim 1 teaches the limitations of claim 11 substantially as claimed except providing application information to the scheduler means: Cameron et al. teaches in columns 7 and 8 an allocator and scheduler component (612 and 710). Figure 7 shows procedures (720, 722, 724, 726, 728, 740, 742, and 744) for the Allocator and Scheduler. Block 736 represents application data which inherently must have been transmitted to the allocator/scheduler.

As to **claim 2**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claim 1 teaches the limitations of claim 11 substantially as claimed except said computing node comprising an operating system for “receiving input” from the prioritizing means and “directing said assigned processes” to execute tasks in a prioritized order: Cameron et al. in Figures 4 and 5 show a prior art task scheduler. Column 5 last paragraph elaborates stating that each scheduler comprises operating system software responsible for controlling the execution of a plurality of tasks. It would have been obvious to one ordinarily skilled in the art at the time the invention was made for the OS to receive information about the execution of the plurality of tasks, because Cameron et al. states in column 6 lines 28-31, “Interactive scheduling using Unix,

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or other operating systems in a single processor environment, is well known to those of ordinary skill in the art.”

As to **claim 3**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 2 teaches the limitations of claim 11 substantially as claimed except the operating system being further adapted to interleave local operations with said tasks: A node or CPU controlled by an operating system would inherently process local operations pertaining to the operating system commands.

As to **claim 4**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 2 teaches the limitations substantially as claimed except application coordinator means for communicating information to said scheduler: Scheduling information must inherently be obtained by some means in order to produce a prioritized list of tasks, however in column 8, Cameron et al. teaches on line 2, “The allocator and scheduler 710 comprises processing logic and data for allocating nodes to specific application programs and for scheduling applications programs for execution.” The “Make Partition” procedure (720) is the request for the allocator/scheduler to initialize tasks which as stated on line 18, “are retrieved and loaded into the nodes associated with the specified partition.”

As to **claim 5**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 2 teaches the limitations substantially as claimed except said local processes being adapted to perform tasks in parallel: Multi-tasking, round robin processing, time slicing, or parallel processing was well known to one of ordinary skill in the art at the time the invention

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was made as indicated in Cameron et al. in column 1 on lines 26 to 30. Also, in column 2 on line 50 Cameron teaches that application programs are allowed to execute on one or more nodes of a partition. Furthermore, column 7 line 40 states, "...an entire application program is active at once across all of the nodes on which the application program is loaded." The multi-node or multi-processor collaborative effort to the processing of a set of tasks or application program processes is the truest definition of parallel processing.

As to **claim 6**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claim 1 teaches the limitations substantially as claimed except said scheduler means comprising global scheduler means which in turn comprises means for dynamically scheduling then communicating the schedule to the local scheduler: Cameron et al. teaches the local nodes and partitions which are assigned to application programs. The allocator and scheduler 612 act functionally as a "global scheduler" by controlling and assigning the appropriate nodes from a particular layer. Column 7 line 50 states, "As will be described below, allocator and scheduler 612 may and typically does operate with a plurality of partitions 614." In column 9 on line 50, "In the preferred embodiment, partition data blocks and application data blocks can be maintained in the same doubly-linked list." Further down on line 64 it is stated that, "The current priority field 918 may dynamically change as the priorities of associated application programs or sub-partitions change priority."

As to **claim 7**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 6 teaches the limitations substantially as claimed except said local scheduler

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being adapted to communicate process information to the global scheduler: Cameron et al. teaches in column 14 lines 12-31 three access modes to the partition data. They are read, write, and execute access modes allowing or disallowing the ability to run application programs from a partition and to create or remove sub-partitions from a partition. This information is also available to the allocator/scheduler 710. Also, figure 7 shows application data 736 specifically available to the allocator/scheduler.

As to **claim 8**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 6 teaches the limitations substantially as claimed except the global scheduler also comprising timer means to effect schedule communication: Cameron et al. teaches in column 11 lines 6-11 a time executed field 1021.

As to **claim 9**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 6 teaches the limitations substantially as claimed except said global scheduler including a local scheduler address table: Cameron et al. teaches in column 13 lines 15-33, "Two hash tables providing a quick look-up mechanism for locating partitions ..."

As to **claim 10**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1, 2, and 6 teaches the limitations substantially as claimed.

As to **claim 12**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 11 teaches the limitations substantially as claimed except invoking operating system priorities to schedule tasks in accordance with said prioritized schedule: The operating system would inherently follow any prioritizing scheme employed by the programmer

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or else there would not be any need to incorporate the local/global scheduling means in the first place.

As to **claim 13**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 11 teaches the limitations substantially as claimed except scheduler means is remote to the node and communicating the schedule to the node: Cameron et al. shows in Figures 4 and 5 that in prior art methods of task management systems, the Scheduler 410, 510 can be remotely located from the processors. In column 6 lines 32-45 refer specifically to Figure 5 noting that the scheduler arranges an orderly schedule for multiple tasks executing on multiple processors. Line 37 mentions a common memory where the schedule information would be communicated to the three processing nodes.

As to **claim 14**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1, 5, 11, and 12 teaches the limitations substantially as claimed.

As to **claim 15**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1, 11, 12, and 14 teaches the limitations substantially as claimed except communicating task execution information to the scheduler: Cameron et al. teaches in column 11 lines 6-11 a time executed field 1021. This "execution information" is part of a process group field 1020 which is updated and available to the scheduler.

As to **claim 16**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1, 5, 11, 12, 14, and 15 teaches the limitations substantially as claimed except

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repeating said steps until all tasks have been completed: Cameron teaches recursive scheduling in column 15 on lines 12-14.

As to **claim 17**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1, 3, 5, 11, 12, and 14 teaches the limitations substantially as claimed.

7. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cameron et al. in view of Admitted Prior Art as applied to claim 1 above, and further in view of Belo (5,379,428).

As to **claim 18**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1, 11, and 13 teaches the limitations substantially as claimed except said remotely located scheduler dynamically maintaining a computing node's list: The apparatus of Cameron dynamically partitions the nodes for application tasks (Figure 7, Schedule Partition 740) then removes partitions (724) when necessary. However, Cameron et al does not explicitly show the list for each node being dynamically manipulated by the allocator/scheduler 710.

Belo teaches a parallel processing computer system. Figure 1 shows a process scheduler and process interrupter 10 encompassing cluster schedulers 20 (a, b, c, ...N). Column 4, line 34 states, "Each cluster scheduler independently schedules processes for the processors in the cluster it serves." Cluster schedulers have a maximum of 255 different process priorities as seen further down on line 42. In column 5 it is taught that the next register will latch the highest waiting process priority number after one of the processors of a cluster becomes available and has

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assumed operation on the process formerly pointed to by this next register. Though not explicitly labeled as such, each cluster scheduler is functionally equivalent to a local scheduler where new tasks are presented and entered into the 255 maximum task entry list. The hardware apparatus of Belo replaces a software version, and there is no distinction between hardwired and coded logic. The dynamic list maintenance of Belo would have been a highly desirable feature in the multi computer processing art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the more elaborate scheduling scheme of Belo, because greater quantities of task processing power would be expected as suggested by Belo in column 4 lines 39-48.

Conclusion

Any inquiry concerning this communication should be directed to **Gary Fourson** at telephone number **(703) 305-4392** or E-mail at the address **gary.fourson@uspto.gov**.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-9600.



gsf

November 17, 1998